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## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>5</sup> :</b> <b>F02M 29/04, 19/06, F02B 23/08</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 93/01406</b> <b>(43) International Publication Date:</b> 21 January 1993 (21.01.93)
<p><b>(21) International Application Number:</b> PCT/NL92/00120</p> <p><b>(22) International Filing Date:</b> 3 July 1992 (03.07.92)</p> <p><b>(30) Priority data:</b>          9101166                      4 July 1991 (04.07.91)                      NL</p> <p><b>(71)(72) Applicant and Inventor:</b> REEFMAN, Frederik, Mannes [NL/NL]; Jan Janslaan 46, NL-7602 VT Almelo (NL).</p> <p><b>(74) Agent:</b> HOIJTINK, Reinoud; Sweelinckplein 1, NL-2517 GK The Hague (NL).</p> <p><b>(81) Designated States:</b> AU, BB, BG, BR, CA, CS, FI, HU, JP, KP, KR, LK, MG, MN, MW, NO, PL, RO, RU, SD, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LU, MC, NL, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, SN, TD, TG).</p>		<p><b>Published</b>  <i>With international search report.          Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.          In English translation (filed in Dutch).</i></p>
<p><b>(54) Title:</b> OPERATING PROCEDURE AND CONSTRUCTION FOR THE CONDITIONING OF A COMBUSTIBLE MIXTURE IN A COMBUSTION ENGINE</p> <p><b>(57) Abstract</b></p> <p>The invention comprises a method and an associated device for conditioning in a combustion engine a flow of gas containing the components fuel and oxygen, such as an air-containing mixture, by placing in the flow of fuel, the flow of oxygen-containing gas or the flow of a mixture of both these components at least one element constructed of wire material of which at least a significant part extends in a direction corresponding with the direction of the flow.</p> <div data-bbox="820 1155 1469 1974"> </div>		

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OPERATING PROCEDURE AND CONSTRUCTION FOR THE  
CONDITIONING OF A COMBUSTIBLE MIXTURE IN A COMBUSTION  
ENGINE.

The invention relates to a method for conditioning in a combustion engine of the components fuel and an oxygen-containing gas such as air. By conditioning is understood producing the conditions in the mixture required for an optimal, complete combustion of this mixture. Optimal combustion is important for the efficiency of a combustion engine as well as for a minimal impact on the environment by clean combustion gases, and, when the combustion engine is applied for instance in a car, can also be important for the acceleration power of that car.

The object of the invention is to provide a method according to which conditioning can be realized in a simple, inexpensive and effective manner, and which can also be applied in known combustion engines.

The object of the invention is realized with a method for conditioning in a combustion engine a flow of gas containing the components fuel and oxygen, such as an air-containing mixture, which method comprises the step of: placing in the flow of fuel, oxygen-containing gas or a mixture thereof at least one element constructed of wire material of which at least a significant part extends in a direction corresponding with the direction of said flow.

It has been found that the fuel consumption of a combustion engine in which the flammable mixture is conditioned according to the invention is markedly lower than in the same engine in which the method according to the invention is not applied. The combustion gases of a combustion engine in which the flammable mixture is conditioned according to the invention are also much cleaner and contain a lower carbon monoxide and hydrocarbon content than those of the same engine in which the method according to the invention is not applied.

In an embodiment of the method at least one element constructed of wire material is placed in a feed line for a fuel.

In another embodiment of the method at least one element constructed of wire material is placed in a feed

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line for an oxygen-containing gas. It has been found that placing an element in at least one of the feed lines of the components of the flammable mixture just prior to the moment of combining results in better combustion.

5 Better combustion can for example also be obtained by placing at least one element constructed of wire material in a mixing chamber for mixing a fuel and an oxygen-containing gas.

10 Another method for improving the combustion can consist for example of placing at least one element constructed of wire material in a transport line of a mixture containing fuel and oxygen.

The invention further relates to a device for conditioning a flammable mixture in a combustion engine  
15 which comprises a fuel feed line, a feed line for an oxygen-containing gas, a mixing chamber for mixing a fuel and an oxygen-containing gas, a transport line for transporting a mixture containing fuel and oxygen and a combustion space. Such a device is known. In the known device it is  
20 not possible to condition the flammable mixture according to the invented method.

The object of the invention in addition to providing the method is also to provide a device for conditioning a flammable mixture according to the above described  
25 method.

This object is realized according to the invention with a device which is characterized by at least one element constructed of wire material placed in the flow of fuel, oxygen-containing gas or a mixture thereof, of which  
30 element at least a significant part extends in a direction corresponding with the direction of said flow.

A preferred embodiment of this device is characterized in that the element constructed of wire material is a wire tree consisting of at least one wire.

35 The element constructed of wire material that characterizes the device according to the invention, can for example have a wave pattern in lengthwise direction.

The element constructed of wire material can preferably be folded over at least once whereby it consists  
40 of a number of parts running approximately parallel to each other. This step makes it possible to enlarge the active surface of the element.

The element constructed of wire material can for instance consist of separate components which run approximately parallel to each other and which are mutually joined at the extremities.

5           At least one element constructed of wire material is preferably arranged in a fuel feed, a feed line for an oxygen-containing gas, a mixing chamber for mixing a fuel and an oxygen-containing gas, a transport line for transporting a fuel and an oxygen-containing mixture or a combustion space for burning a fuel and an oxygen-containing mixture. Combinations of arrangements of elements constructed of wire material in a plurality of spaces is also possible. It has been found herein that the positive effects of arranging at least one element increase the closer  
10           it is arranged to the combustion space.

Application of the method and the device according to the inventions in combustion engines of cars resulted in substantial reductions in fuel consumption, particularly petrol consumption, L.P.G. or diesel fuel and in a substantial reduction of the carbon monoxide and hydrocarbon content of the exhaust gases.

The method is not limited to specific types of combustion engines but lends itself to use irrespective of the type of fuel (for example petrol, L.P.G., diesel fuel)  
25           and irrespective of the manner in which the flammable mixture reaches the combustion chamber (via a carburetor or by means of an injection system).

The invention will be elucidated further in the following with reference to the drawings. Herein:

30           fig. 1 shows a greatly simplified schematic vertical cross section of a carburetor and a cylinder;

          fig. 2 shows a perspective view of an element constructed of wire material in the form of a mesh piece rolled up in lengthwise direction;

35           fig. 3 shows a perspective view of an element constructed of wire material in the form of a piece of mesh folded over a number of times;

          fig. 4 is a perspective view of an element constructed of wire material in the form of a wire folded over  
40           a number of times;

          fig. 5 is a perspective view of an element constructed of wire material in the form of a piece of mesh

folded over once and having a wave pattern in lengthwise direction; and

fig. 6 shows a perspective view of an element constructed of wire material that consists of separate components which run approximately parallel to each other and which are mutually joined at the extremities.

In the carburetor 1 (see fig. 1) air is drawn in known manner into the mixing chamber 2 via air filter 3 and air inlet 4. The fuel 5, in this case petrol, is carried into the mixing chamber 2 by means of a dosing system consisting of a float chamber 6 with float 7 and cut-off valve 8 via a main nozzle 9, a nozzle tube 10 and a nozzle aperture 11, in this example in the middle of the venturi tube 12 where the fuel is drawn along by and mixed with the air coming from the air inlet 4. The flammable mixture leaves mixing chamber 2 via the transport line 13 for the flammable mixture in the direction of the arrows 14. For the sake of a good understanding the figure further shows a venting 15 of the float chamber 6, a throttle valve 16 and a zero load system 17 indicated with dashed lines.

According to the invention the flammable mixture can be conditioned prior to leaving mixing chamber 2 via the transport line 13 by arranging elements constructed of wire material. In the figure an element 18 constructed of wire material is thus arranged in the feed line for fuel or the nozzle tube 11. In the transport line 13 for the flammable mixture an element 19 constructed of wire material is also arranged just in front of the combustion space 20. This combustion space 20 is bounded by a cylinder 21 and a piston 22.

The rolled-up piece of mesh 23 shown in fig. 2 can be placed for example in a pipe. The piece of mesh 24 folded over a number of times of fig. 3 can likewise be placed for instance in a pipe. See above the element 19 constructed of wire material that is placed in the transport line 13 for the flammable mixture in fig. 1.

The element 25 constructed of wire material shown in fig. 4 is constructed from a single wire which is folded over a number of times. The wire material 18 shown in fig. 1 roughly corresponds with the element 25 shown in fig. 4.

Shown in fig. 5 is an element 26 formed from a piece of mesh folded over and waved in lengthwise direc-



tion.

Fig. 6 shows an element 27 constructed from a number of separate wire pieces which are mutually joined at the extremities.

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## CLAIMS

1. Method for conditioning in a combustion engine a flow of gas containing the components fuel and oxygen, such as an air-containing mixture, which method comprises the step of: placing in the flow of fuel, oxygen-containing  
5 gas or a mixture thereof at least one element constructed of wire material, of which element at least a significant part extends in a direction corresponding with the direction of said flow.

2. Method as claimed in claim 1, characterized in  
10 that at least one element constructed of wire material is placed in a feed line for a fuel.

3. Method as claimed in claim 1, characterized in that at least one element constructed of wire material is placed in a feed line for an oxygen-containing gas.

15 4. Method as claimed in claim 1, characterized in that at least one element constructed of wire material is placed in a mixing chamber for mixing a fuel and an oxygen-containing gas.

5. Method as claimed in claim 1, characterized in  
20 that at least one element constructed of wire material is placed in a transport line of a mixture containing fuel and oxygen.

6. Method as claimed in claim 1, characterized in that at least one element constructed of wire material is  
25 placed in a combustion space for combusting a mixture containing a fuel and oxygen.

7. Device for conditioning a flammable mixture in a combustion engine according to a method as claimed in claim 1, comprising a fuel feed line, a feed line for an  
30 oxygen-containing gas, a mixing chamber for mixing a fuel and an oxygen-containing gas, a transport line for transporting a mixture containing fuel and oxygen and a combustion space, characterized by at least one element constructed of wire material which is placed in the flow of fuel,  
35 oxygen-containing gas or a mixture thereof and of which at least a significant part extends in a direction corresponding with the direction of said flow.

8. Device as claimed in claim 7, characterized in that the element constructed of wire material is a mesh-like network formed from at least one layer.

9. Device as claimed in claim 7, characterized in that the element constructed of wire material is a wire tree consisting of at least one wire.

10. Device as claimed in any of the claims 7, 8, 9, characterized in that the element constructed of wire material has a wave pattern in lengthwise direction.

11. Device as claimed in any of the claims 7, 8, 9, 10, characterized in that the element constructed of wire material is folded over at least once and thereby consists of parts running approximately parallel to each other.

12. Device as claimed in any of the claims 7-11, characterized in that the element constructed of wire material consists of separate components which run approximately parallel to each other and which are mutually joined at the extremities.

13. Device as claimed in any of the claims 7-12, characterized in that at least one element constructed of wire material is arranged in a fuel feed line.

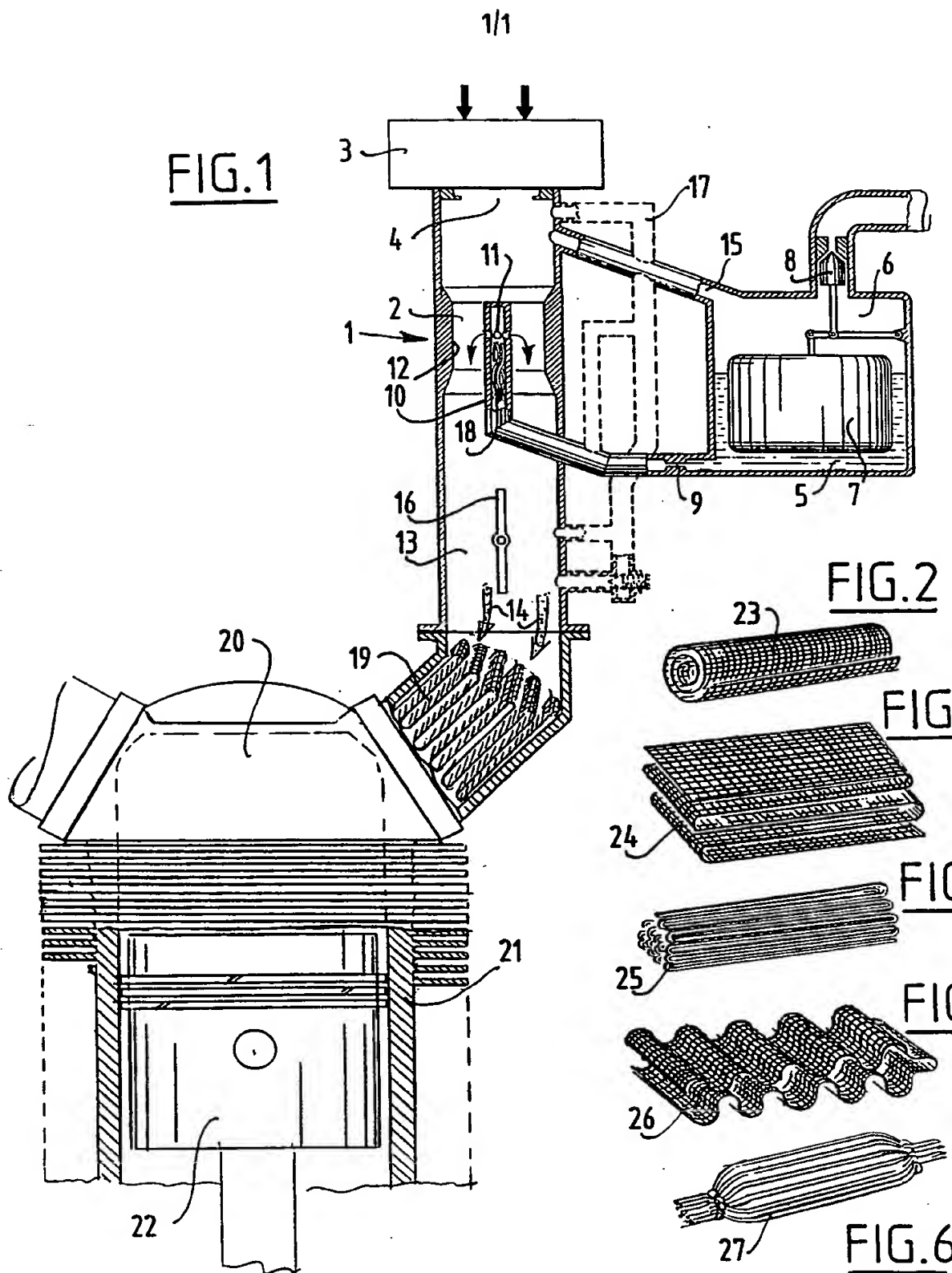
14. Device as claimed in any of the claims 7-12, characterized in that at least one element constructed of wire material is arranged in a feed line for an oxygen-containing gas.

15. Device as claimed in any of the claims 7-12, characterized in that at least one element constructed of wire material is arranged in a mixing chamber for mixing a fuel and an oxygen-containing gas.

16. Device as claimed in any of the claims 7-12, characterized in that at least one element constructed of wire material is arranged in a transport line for transporting a fuel and an oxygen-containing mixture.

17. Device as claimed in any of the claims 7-12, characterized in that at least one element constructed of wire material is arranged in a combustion space for combusting a mixture containing fuel and oxygen.

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## INTERNATIONAL SEARCH REPORT

International Application No

PCT/NL 92/00120

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (if several classification symbols apply, indicate all) <sup>6</sup>		
According to International Patent Classification (IPC) or to both National Classification and IPC		
Int.Cl. 5 F02M29/04; F02M19/06; F02B23/08		
<b>II. FIELDS SEARCHED</b>		
Minimum Documentation Searched <sup>7</sup>		
Classification System	Classification Symbols	
Int.Cl. 5	F02M ; F02B	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched <sup>8</sup>		
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT<sup>9</sup></b>		
Category <sup>10</sup>	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>
A	US,A,2 291 418 (STORER) 28 July 1942 see page 2, column 1, line 8 - line 14; figure 1 ---	1,2,7,13
A	US,A,4 871 381 (SMITH) 3 October 1989 see column 5, line 18 - line 36; figure 6 ---	1,3,7,8, 14
A	US,A,4 968 458 (BESNIA) 6 November 1990 see column 3, line 38 - column 4, line 33; figures 1-5 ---	1,4,7,8, 15
A	US,A,4 974 573 (JENSEN) 4 December 1990 see column 2, line 59 - column 4, line 21; figures 1-7 ---	1,5,7,9, 16
	--- -/--	
<p><sup>10</sup> Special categories of cited documents : <sup>10</sup></p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&amp;" document member of the same patent family</p>		
<b>IV. CERTIFICATION</b>		
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International Searching Authority	Signature of Authorized Officer	
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III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
A	US,A,3 987 776 (GOTO) 26 October 1976 see column 2, line 52 - column 3, line 25; figures 1,6 -----	1,6,7,17

**ANNEX TO THE INTERNATIONAL SEARCH REPORT  
ON INTERNATIONAL PATENT APPLICATION NO.**

NL 9200120  
SA 63263

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US-A-2291418		None	
US-A-4871381	03-10-89	None	
US-A-4968458	06-11-90	None	
US-A-4974573	04-12-90	None	
US-A-3987776	26-10-76	None	

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